Terrestrial Invasive Plants

Michigan 4-H Youth Conservation Council

2012

Focus Statement

The focus of the Michigan 4-H Youth Conservation Council is to promote the adoption of a standardized assessment system for the identification of invasive terrestrial plant species in collaboration with Michigan Invasive Plant Council (MIPC) and to raise public awareness of said topic while making a legitimate compromise regarding the concerns of both the industry and the environment.

Invasive Definitions (cont.)

- Non-native (exotic) species: a species that is not indigenous to an ecosystem
- Native species: a species that occurs naturally in an ecosystem

Sam

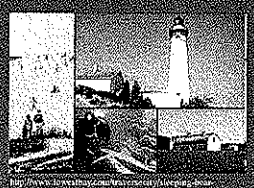
Invasive Definitions (cont.)

- Noxious weeds, as defined by the USDA: a plant that is found to cause damage to the environment, the economy and human health
- Invasive species, as defined by Executive Order 13112: a species that is both non-native and causes harm to the environment, the economy and human health

Sam

Tourism on the Economy

- 2010 tourism brought an increase of $2.1 billion
- Travelers spent 20.1% more in 2010 than any other year



Samantha

Tourism in Michigan

- The Sleeping Bear Dunes
- Mackinac Island
- Outdoor sports and activities
- Fishing on the Great Lakes

Samantha

Invasive Species Hurt Tourism

- 668,000 people visited Sleeping Bear Dunes in 2011
- Phragmites and Spotted Knapweed could decrease tourism on the dunes

Allison

Invasive Species Hurt Tourism (cont.)

- More than 1 million people visit Mackinaw Island each year
- The non-native species are decreasing tourism in the area

Allison

Environmental Damage

- Create large monocultures
  - Destroys native plant populations
- Force many protected or endangered animals to leave an area
- Natural spreading makes the fight an ongoing task

Sam

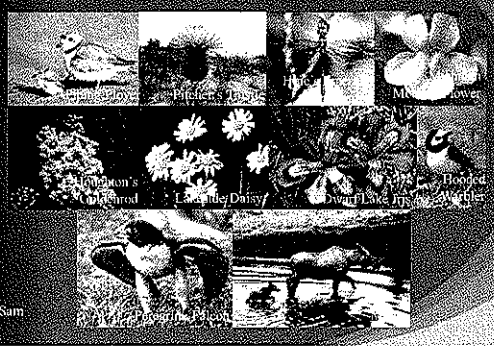
Invasive Plant Examples

- Spotted Knapweed
  - Releases toxins into the ground killing native plants
- Phragmites
  - Over 50 state concerned species and habitats

Spotted Knapweed

Sam

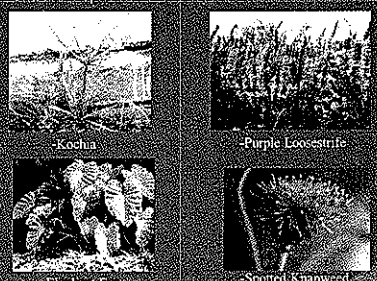
Species Affected



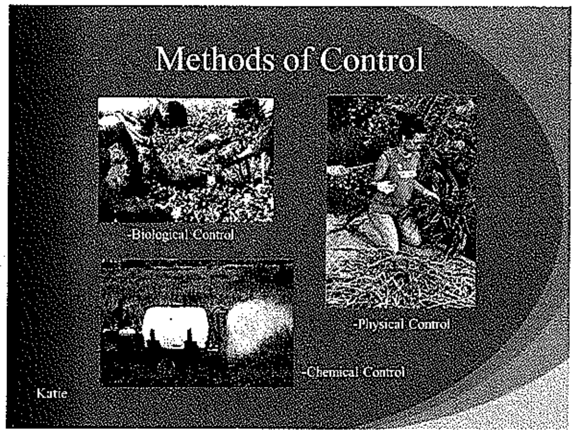
Sam

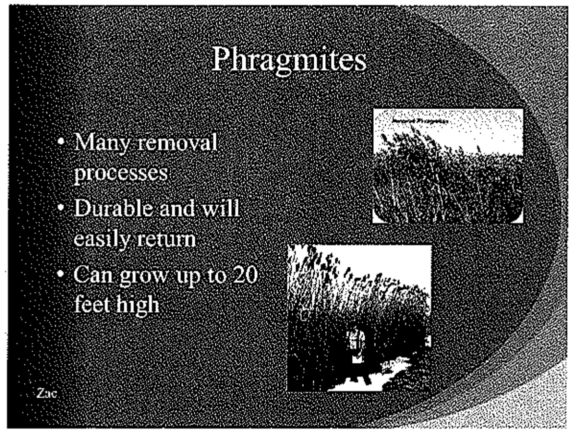
Differentiating Species

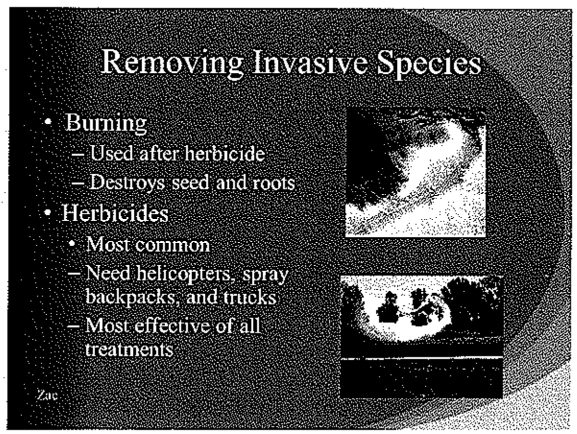
Non-native Species	Non-native Invasives
-Kochia	-Purple Loosestrife
-Elephant Ear	-Spotted Knapweed

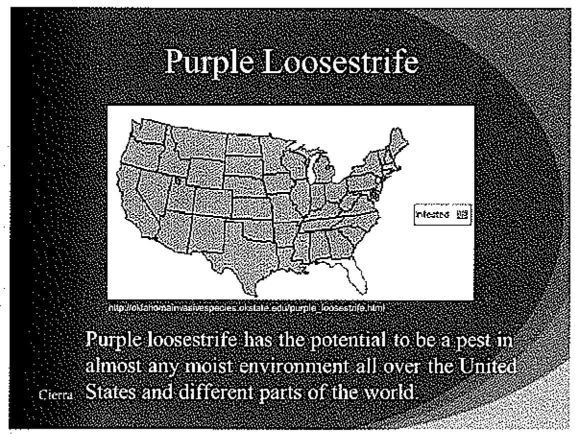


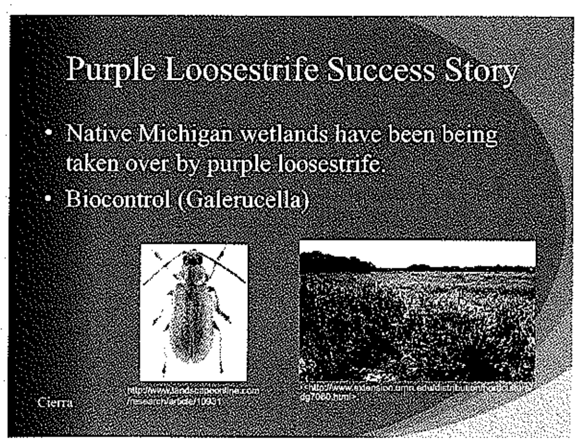
Katie

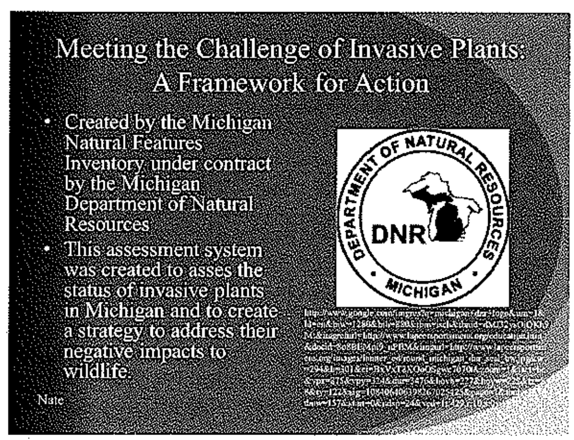

Methods of Control
-Biological Control
-Physical Control
-Chemical Control
Katie


Phragmites
• Many removal processes
• Durable and will easily return
• Can grow up to 20 feet high
Zac


Removing Invasive Species
• Burning
– Used after herbicide
– Destroys seed and roots
• Herbicides
• Most common
– Need helicopters, spray backpacks, and trucks
– Most effective of all treatments
Zac


Purple Loosestrife
Infected
http://oklahomainvasivespecies.okstate.edu/purple_loosestrife.html
Purple loosestrife has the potential to be a pest in almost any moist environment all over the United States and different parts of the world.
Cierra


Purple Loosestrife Success Story
• Native Michigan wetlands have been being taken over by purple loosestrife.
• Biocontrol (Galerucella)
http://www.landscapeonline.com /research/article/10931
<http://www.extension.umn.edu/distribution/horticulture/dg7080.html>
Cierra


Meeting the Challenge of Invasive Plants: A Framework for Action
• Created by the Michigan Natural Features Inventory under contract by the Michigan Department of Natural Resources
• This assessment system was created to asses the status of invasive plants in Michigan and to create a strategy to address their negative impacts to wildlife.
DEPARTMENT OF NATURAL RESOURCES
DNR
MICHIGAN
Nate

Six Goals

- Goal 1: Leadership and Coordination
- Goal 2: Assessment and Research
- Goal 3: Prevention
- Goal 4: Early Detection and Rapid Response
- Goal 5: Control, Management, and Restoration
- Goal 6: Education and Outreach

Michigan Natural Features Inventory

Nate

Industry in Michigan

Nursery and Landscaping

- Provides over 600,000 jobs
- Contributes $1.2 billion to economy
- 2nd largest agricultural commodity in Michigan
- 5th largest nursery industry in nation

MNLA

http://www.mnla.org/membership/mnla_endorsed_services

Melissa

How Industry Works

- Nursery
  - Buys
  - Grows
  - Sells
- Landscaping
  - Buys
  - Designs
  - Plants

http://www.klinelandscaping.com/

Melissa

Problems to be Resolved

- Conflicts of interest between the Industry and State Agencies
- Lack of sale regulations and public awareness
- Meijer Partnership with the Nature Conservancy

Natalie

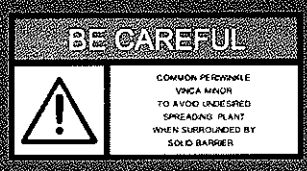
Point of Sale Invasive Plant Warning

- Informative statement attached to plant
- Only for plant sold in horticulture industry
  - Invasive in certain circumstances
  - Informs consumers of invasive potential
- Recommends safe planting methods
  - Location
  - Information about how the plant spreads
- Think Environmentally, Plant Responsibly

Dakota

Sample Warning Label

"Common Periwinkle, *Vinca minor*, may result in undesired excessive spreading if not contained by a solid barrier such as a sidewalk, courtyard or when in a pot… Please Think Environmentally, Plant Responsibly… Right Plant, Right Place"

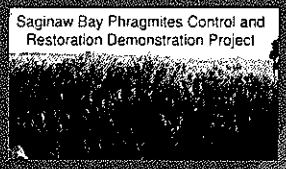


www.warninglabelgenerator.com

Dakota

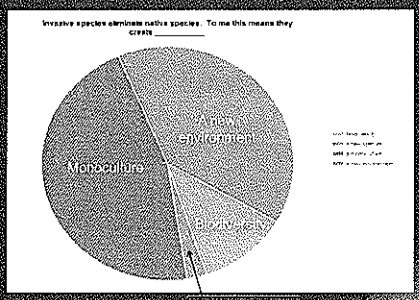
Public Education on Invasive Species

- Education of the public should expand into:
- Commercials
- Expanding into Conventions
- More information available at State and National Parks



Riley

Invasive species eliminate native species. To me this means they create:



Madelyn

Public Education Needs

- Assign people to give lectures
- Public libraries or stores
- Newspapers or pamphlets

Madelyn

Federal Act 6006 of the Safe Accountable Flexible Efficient Transportation Equity Monitoring

- Weed prevention
- Rapid response to new weed infestations
- Control
- Reinstallation
- Monitoring by State or Transportation Establishment
- Other Consequences

Margaret

Plant Protection Act

No one can:

- Import
- Enter
- Export
- Move
- Except if they are authorized under a general or specific permit

- Only Secretary of the Department of Agriculture can move the invasive species in United States or export of the United States

Margaret

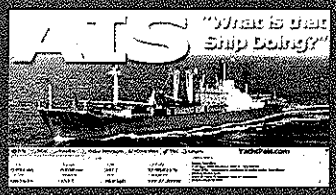
Senate Bill 18

- Purple loosestrife (Lythrum salicaria)
- Japanese knotweed (Fallopia japonica)

Jerry

House Bill No. 4826

- Legislation or rules to prevent the introduction and spread of AIS



http://yachtpals.com/ais-boats-4116

Jerry

Plant Laws for Terrestrial Invasive Species in Michigan

Prohibited
- 19 species
- Regulates the sale, advertisement, or transport of certain noxious weed seeds
- Can only be considered bothersome or economically detrimental

Restricted
- 23 species
- No weed seed can be sold or transported into the state

Mallory

Plant Laws for Terrestrial Invasive Species in Michigan

- Created under Regulation 715 The Michigan Seed Law (Act 329 of 1965)
  - Limit on percentage of weed seed
- Regulates
  - Labeling
  - Coloration
  - Advertising
  - Sale
  - Offering
  - Exposing
  - Transportation
- Violations under section 286.715

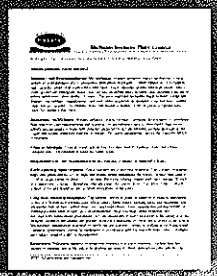
http://en.wikipedia.org/wiki/Allium_vineale

Mallory

The Michigan Invasive Plant Council Assessment Tool

•Section I-VI: Reports on Biological Character, Impact, Distribution, Control Methods, Management Effort, Value within the state

•Section VII: Summary/Plan of action: Garlic Mustard
- •Summary: Well established in Lower Peninsula, spreads prolifically, especially in disturbed areas and forests.
- •Invasiveness Rank: Very high due to high seed production and dispersal
- •Value: Very low, only used rarely in cooking
- •Responsible use: Not recommended
- •Long term control: Priority elimination of small infestations, thorough burning/herbicides for dense, established populations



MIPC Alliaria Petiolata Summary.doc / Michigan Invasive Plant Council, 2009

Duncan

Michigan Invasive Plant Council

- Section I – Biological Character, Reproductive Ability, and Dispersal
- Section II – Impact
- Section III – Distribution

Nicholas

MIPC

- Section IV – Control Methods
- Section V – Control Effort
- Section VI – Value within in the State of Michigan

Nicholas

Section VII

- Summary/Plan of action; Garlic Mustard
  - Summary: Well established in Lower Peninsula, spreads prolifically, especially in disturbed areas and forests.
  - Invasiveness Rank: Very high due to high seed production and dispersal
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Duncan

Notre Dame Assessment

- Use 3 point strategy
- Goals
  - Minimize Trade-offs
    - Human Health
    - Environmental
  - Discover Win-Win Solutions

http://www.chicagonewscoop.org/notre-dame-professor-leads-effort-to-keep-asian-carp-out-of-great-lakes/

Kennedy

Assessment Main Points

- Prevention
- Early Detection/ Rapid Response
- Management of Established
- eDNA

http://www.lrc.usace.army.mil/AsianCarp/MonitoringEDNApg.html

Kennedy

National Wildlife Federation Invasive Species Assessment Protocol

- Currently no official assessment program in Michigan
- This is a good example of the several different protocols in the works
  - Already used on 500 different species
  - Compile a list of both non-native and invasive species

Susan

National Wildlife Federation Invasive Species Assessment Protocol (cont.)

- Assessment is comprised of 22 questions
  - 2 preliminary questions
  - 20 in-depth questions
    - I-Rank System
      - 4 sections
        - » Dealing with the impact on human and environmental life
        - » Dealing with the reproductive nature of species
        - » Dealing with the eradication costs

Susan

Risk Benefit Analysis

- Criteria
  - Must be easy to do
  - Identify all the positives and least false
  - Must be able to be updated constantly
- Anything else
  - Identify real harm
  - Early detection rapid response

Kenny

Risk Benefit Analysis (cont.)

- Recommendation
  - Out of three the MIPC was favored

Kenny

Recommendations

- The Michigan 4-H Youth Conservation Council would like to set forth the following recommendations:
  - To make sure the State's Internal Forces, contracted crews, and construction contractors would keep monitoring the potentially invasive species that they are working to control
  - To support public education on the process of the importance controlling invasive plants.

Recommendations (cont.)

- For the horticulture industry to include informational statements at the point-of-sale
- To fund organizations that are making an effort to prevent and control invasive species and educate the public
- To adopt Executive Order13112 as the proper invasive species definitions
- To adopt a state standardized assessment system for the identification of terrestrial non-native invasive species

Conclusion

Michigan 4-H Youth Conservation Council

April 19, 2012

Terrestrial Invasive Plants

April 19 2012

The focus of the Michigan 4-H Youth Conservation Council is to promote the adoption of a standardized assessment system for the identification of invasive terrestrial plant species in collaboration with Michigan Invasive Plant Council (MIPC) and to raise public awareness of said topic while making a legitimate compromise regarding the concerns of both the industry and the environment.

Michigan 4-H Youth Conservation Council

Introduction/Focus Statement	Sam Owens, Midland
Invasive Definitions	Sam Owens
Tourism in Michigan	Samantha Bellairs, Washtenaw
Invasive Species Impact on Tourism	Allison Melcher, Washtenaw
Impact on Environment and Endangered Species	Samantha Ellison, Tuscola
Prevention of Invasive Species	Katie Fassone, Saginaw
Removal of Invasive Phragmites	Zachary Childs, Genesse
Purple Loosestrife Success Story	Cierra Dane, Hillsdale
DNR and MNFI Guidelines	Nate Garrett, Calhoun
Industry in Michigan	Melissa Mikolowski, Macomb
An Invasive Industry	Natalie Wright, Ingham
Point of Sale Invasive Plant Warning	Dakota Hewlett, Kent
Public Education	Riley Burch, Benzie
Public Education	Madelyn McMillan, Saginaw
Existing Federal Regulation	Margaret Spens, Presque Isle
Existing State Regulation	Jerry Dunham, Benzie
Proposed Legislation	Mallory Ramelis, Mackinac
MIPC Assessment Tool	Duncan MacLeod, Kent
MIPC Assessment Tool	Nicolas Heilman, Mecosta
Notre Dame Research/Nature Conservancy	Kennedy Cogswell, Montcalm
NWF Assessment Tool	Susan Smith, Mecosta
Risk Benefit Analysis	Kenny Smith, Mecosta
Conclusion/Recommendations	Susan Smith

2012 Michigan 4-H Youth Conservation Council Focus Statement:

The focus of the Michigan 4-H Youth Conservation Council is to promote the adoption of a standardized assessment system for the identification of invasive terrestrial plant species in collaboration with Michigan Invasive Plant Council (MIPC) and to raise public awareness of said topic while making a legitimate compromise regarding the concerns of both the industry and the environment.

Introduction:

At the beginning of this council year, we debated over environmental issues facing our state and selected the threat of invasive plant species as the most important issue we wished to address. As youth concerned with the damage caused to the state by invasive species both environmentally and economically, we decided this was a particularly pressing issue.

Invasive Plants like Phragmites that currently plague areas of the state and threaten native ecosystems and the beauty of our lakes and natural areas must be controlled. In addition to plants that are a current problem, we realize the importance of identifying and taking measures to control species early that may become difficult to control later. We also are concerned with the need for more objective methods of identifying and dealing with invasive species to make best use of limited resources and focus effort where it can be most effective.

Keeping invasive plants and other species in check is important to our tourism and many industries important to the state. Through the information presented here and our conclusions and recommendations, we wish to help make control of invasive plant species as efficient and effective as possible for the good of our state.

Invasive Definitions
Samuel Owens

Federal Executive Order 13112 defines an invasive species according to two guidelines. First the species must be an alien, or non-native, to the ecosystem in question. Secondly the species must be considered to cause, or have the possibility to, economic or environmental harm or harm to human health. Under this order plants, animals, and other organisms may be considered invasive and be classified as such by the above speculations. In the situation that an organism is non-native yet causes no observed harm to the economy, environment, or human health it is considered an alien species, not an invasive. Since the order specifically refers to the species being an alien to the ecosystem it bypasses the thought that a native plant could be invasive. This is due to the fact that if something leaves its original habitat it therefore becomes a non-native and may be certified as an invasive. The Executive Order states nothing about a native species harming its original system and whether or not it would be considered invasive.[1] Many groups such as the National Invasive Species Council (NISC) use Executive Order 13112 when determining what is and what is not an invasive species.[2]

A native species, as defined by the Natural Resources Conservation Service, is "a part of the balance of nature that has developed over hundreds or thousands of years in a particular region or ecosystem. Whereas they define a non-native species as one that has been "introduced with human help (intentionally or accidently) to a new place or new type of habitat where it was not previously found." They also mention that some species may not continue in certain systems without continued human help, their example being some ornamental plants. Species that do not require human interference to exist for a certain period of time in an area are referred to as naturalized. Though the council only specified plants in their definitions it is easy to integrate animals within their current definitions.[3]

Tourism in Michigan
Samantha Bellairs

Tourism in Michigan contributes a great deal to our economy; year round people can find fun things to do. From the snowy environment of winter perfect for skiing and snowmobiling, to the hot summertime, where visitors can find a good time of the beaches and peers of the great lakes. The unique state of Michigan is full of things to do. Michigan tourism is one of the largest in the country, with swarms of tourists flocking to our national lakeshores each year.[4] Some of the most popular sites are also some of the most beautiful sites in Michigan, like Mackinac Island and the Sleeping Bear Dunes.

The importance of the tourism industry in Michigan is indicated by the number of people who come here throughout the year. With twenty-two million visitors annually visiting our unique state it is no wonder why tourism is one of our top industries.[1] In 2010 Michigan's Travel Michigan tourist industry grew by $2.1 billion dollars, increasing from $15.1 billion to $17.2

billion in one year.[5] The pure Michigan travel campaign inspired 3.2 million visitors from out of state, with them come billions of dollars that are added to our economy.[6]

. Another industry which still interests many tourists is fishing, this popular sport and industry includes thousands of clients who buy the licenses, which in turn gives our state over $21 million a year.[7]

Mackinac Island is one of the top ten islands of the world, known not only for their fudge this island is also one of the most popular tourist spots. The Mackinac State Park is the second national park created only three years after the Yellow-stone National Park. Tourist may also go to the forts and museums which have stood since the American Revolution.[8] The sleeping Bear Dunes are another beautiful tourist destination for many tourists. This state park was set aside in 1970, by the 1970 establishment act. With shipwrecks to explore and miles of scenic beaches to walk along there is no shortage of things to do along this national lakeshore.[9]

Michigan tourism is very important to our economy; it brings in money and new faces to see. But how long will that last? Invasive species are taking away our "Pure" Michigan, destroying the dunes, invading our forests, and replacing the native with the invasive.

Invasive Species Impact on Tourism
Allison Melcher

Tourism is one of the largest sources of income for Michigan. In 2007, tourism generated $2.4 billion dollars in tax revenue on the state and local level and created 148,700 jobs in the state. In 2010, tourism generated $17.2 billion dollars in revenue. Some of the most popular places to visit are Mackinac Island and the Sleeping Bear Dunes.[10]

"335 exotic species have been found on the Sleeping Bear Dunes" including common buckthorn, Phragmites and spotted knapweed. Spotted knapweed is of special concern because it crowds out pitcher's thistle, which is a rare species. 668,000 people visited Sleeping Bear Dunes in 20117. Phragmites is starting to spread over the dunes like it has spread throughout roadside ditches, blocking the view of the water. Michigan is known for its beautiful lakes. If you can't see the lakes, what is the point of coming to Michigan? Invasive species significantly decrease the dunes' ability to attract tourists.[11]

Mackinac Island is one of the most visited tourism sites in Michigan. More than one million people visit Mackinac Island each year. One main reason tourists go to Mackinac Island is to see its natural beauty. Norway maples have replaced many of the native trees on the East and West bluffs on Mackinac Island. If the Norway maples continue to spread, they could block the view of Lake Huron. 25% of vascular plants on Mackinac Island are non-native. These non-native plants could become invasive and affect tourism on the island.[12]

Fishing and boating are popular tourist activities in Michigan. The sea lamprey and round goby have decreased the native fish populations in the Great Lakes. Generally, invasive species are not good for sport fishing or eating.[13] Eurasian water milfoil has already clogged waterways in Michigan and Hydrilla could soon do the same if it is not contained. Zebra Mussels, Quagga Mussels, Asian clams, and Eurasian water-milfoil are also harming the fishing and boating industry in Michigan.[14]

Hiking is another popular activity in Michigan. Many invasive plants cause soil erosion when they replace the native plants' fibrous roots with their own taproots.[15] Soil erosion can cause hiking paths and even sand dunes to fall apart. If the hiking paths and sand dunes are gone, tourism will greatly decrease.[16] I recommend that a system to identify and track the progress of invasive species be created. Early detection and identification of invasive species will allow us to keep harmful species out of our beautiful natural areas and keep Michigan's tourism industry alive.

Impact on Environment and Endangered Species
Samantha Ellison

The impact of invasive species on the environment is seen wherever you look. There is evidence showing from the monocultures that invasives create by out competing native plants. These invasives are also forcing many endangered species to disappear from the area or even the state because they don't have a suitable habitat. The impact of these invasive species continues to grow still because of the natural spreading that has always been a part of nature. The protection of our environment has a big impact on our state and should be strongly monitored.

Invasive species are extremely noticeable in the areas where they devastate the natural plant environment. These monocultures can cover a large area that was once covered by indigenous plants that are now out competed by these invasives that have no natural predators. These invasive species have become a major factor in the 46% decline of endangered species as of 1999.These monocultures can cause extensive damage to the native plant population to the point that the original land can never be fully restored. The over population of invasives is caused by no one taking time to control the problem when it first begins. These species must be stopped before the completely destroy our ecosystems.[17]

There are many different ways to show the destruction that these invasives have caused to Michigan's ecosystem. One example is of Kudzu a plant from Japan that has grown rampant in the southern United States and has been found overwintering in Michigan. Kudzu is able to completely choke out native plants and even trees with its massive blanket of vines and leaves. There are also the environmental damages of spotted knapweed. This plant can release toxins into the ground killing off its surrounding plants allowing only more Spotted Knapweed to

grow there. These invasives will leave permanent damage on out ecosystem if they are not soon controlled.[18]

While these invasive plants are affecting the ecosystem they are also limiting the area for our endangered species to live. Many invasive species require a very specific habitat in which they will be able to live and thrive. These essential areas are constantly being invaded and destroyed by invasives and further depleting the population of these protected creatures. For example, Phragmites has taken over the Great Lakes shorelines. These are affecting many threatened and endangered species including:

- Piping Plover (Endangered)
- Hine's Emerald Dragonfly (Endangered)
- Houghton's Goldenrod (Threatened)
- Michigan Monkey-Flower (Endangered)
- Pitcher's Thistle (Threatened)
- Lakeside Daisy (Endangered)
- Dwarf-lake Iris (Threatened)

Phragmites is also upsetting the migration of birds, the spawning of fish, and the hunting patterns of waterfowl. This greatly decreases the value of our scenery to tourist being that they cannot see the wildlife. All these creatures and more use these coastal areas that are being destroyed by Phragmites.[19] [20]

Natural spreading is also a cause of the ever-ongoing fight to stop the invasive species. The natural dispersal of seed has gone on since the beginning of times. There is the spreading of pods breaking open and the winding carrying the seeds away. Animals are also some of the worst transmitters of invasive plant seeds. Many invasive plants have berries, which the birds are more than happy to eat and deposit in other areas. So while we may believe that an invasive species is gone from an area we can come back and find a population explosion. These invasives may now never be controlled and their damages may still continue to ruin our environment.

The destruction of our environment from invasive species is a task that may become a problem we will live with ceaselessly, if we don't change our tactics in controlling these invasives. We can lose our natural resources, scenic landscapes, and creatures, both plant and animal, that makes our state so beautiful. The population of the invasive species will only get more out of hand if we don't act now. It is our duty to take care of our environment as our homeland. These problems are on us to be stopped while we still can.

Prevention of Invasive Species
Katie Fassone

Once they are established, invasive species can be difficult or impossible to remove. Control measures are usually expensive. Preventing invasive species from coming to the state in the first place, or from spreading if they do arrive, is the key to avoiding long-term harm to Michigan's ecosystems. To manage invasive species, we must find them early and respond quickly. Finding new invasive species before they spread widely or become established allows us to try to eliminate populations as soon as possible. If it's not possible to eliminate them, early response could make control measures more effective and reduce their costs. Michigan is using limited short-term Federal funds to work with partners to improve guidelines, tools and processes for early detection and rapid response in the state.

Not all non-native plants are harmful to our lovely environment. Some may help in ways to improve its beauty. The harmful non-native plants tend to share the same characteristics as listed below:[21]

- They produce abundant viable seeds. For example, the garlic mustard plant can produce hundreds to thousands of seeds.
- May produce seeds that germinate and leaves that leaf out early in the spring, and they keep their leaves late into the fall, allowing them to photosynthesize earlier and later than native plants. For example, Norway maple seedlings can be 6 inches tall before native maples sprout, and buckthorns keep their leaves into November, long after native plants have lost theirs.
- Have few pests or diseases. Non-native plants did not arrive with the accompanying pests and diseases that kept them in check in their native environments.
- May produce toxins that make it difficult for other plants to grow nearby.
- Invade a wide variety of soil types, moisture regimes and light conditions. Invasives are typically generalists and can be difficult to kill.
- Often produce monocultures over large areas so few other species can reproduce and grow. For example, Phragmites, Japanese knotweed and garlic mustard are just a few invasives that spread quickly and cover large areas, eliminating the diversity of species that once grew on that site.
- Reproduce through a rhizomatous root system, making it easier for them to spread far and wide.

Specific permits are necessary to import specific plants, plant products, and organisms into the U.S. and across state borders. Plant and plant product permits include plants for planting such as nursery stock and small seed lots. The permits also emphasize plant products such as fruits and vegetable, timber, cotton and cut flowers. The seeds and plant materials of invasive species can work their way into clothing, shoe and tire treads or stow away in gear and in a pet's fur, and thus manage to travel far from their original infestation and start a new one wherever they land.[22]

There are several very simple activities that can be done to prevent movement of invasive species:

- Wear clothing and footwear that are not "seed friendly." Avoid bulky knits as your external layer, try to wear gaiters to prevent seeds from sticking, and wear low tread shoes or boots wherever possible to avoid buildup of seeds and debris in the tread.
- Clean your equipment before you bring it in to or out of an activity location, making sure to remove seeds and other living material. This can include your clothing and footwear, your vehicles (including boats, trucks, cars, ATVs), trailers, the fur and feet of any animals you have brought to use while hunting or trapping (hunting dogs), any traps used, bags used to carry equipment, bilges and live wells on boats, etc.
- When you do remove seeds or other materials from your clothing and equipment, do not do so in or near a waterway; this can increase the spread of invasive species.
- When moving off trail, attempt to avoid areas that are infested with invasive species. Not only can they be spread by contact with humans or animals, but some can cause irritation or damage to skin.
- Attempt to stay on trail with motor vehicles, and attempt to minimize soil disturbance wherever you spend time outdoors. Disturbed soil is prime habitat for invasive species, and minimizing disturbance will reduce the habitat available.[23]

There are various methods of removing and destroying these "alien" plants. Three general ways are chemical, biological, and physical. The chemical way of abolishing invasives involves applying herbicides to eliminate invasive species. When used properly, these pesticides have little effect on Michigan's native species and ecosystems. Using physical methods requires putting up barriers to prevent invasive species from moving into new areas, or physically removing a species from its new habitat. Dredging, dams, traps, electrical fields, mechanical barriers, trenching and sticky bands to catch insects are examples of barriers used to prevent invasive species from entering new areas. Methods of physically removing invasive species from new habitats include mechanical harvesting, hand-pulling plants, and cutting and destroying infested material. Lastly, if use of the biological control, this involves using a living organism to reduce or eliminate the population of the invasive species. The organism may eat the invasive species or cause it to become diseased. Control agents are often brought from the original habitat of the invasive species. Proposals for biological control must be carefully assessed to ensure the control species does not become invasive and cause as much damage as the species to be controlled. [24]

Monitoring and controlling invasive species can be a troubling task, unless you know the right steps to take. It is all about correctly identifying the species as invasive and harmful then making fast and rapid responses to dispose and annihilate it. Methods of destroying them contribute to keeping our Michigan environment safe. But the most efficient and effective way to keep them from achieving damage is to prevent the introduction. This will disable the species of even having the chance to spread. "These species are wanted dead, not alive."

Removal of Invasive Phragmites
Zachary Childs

The invasion of harmful Phragmites known as *Phragmites australis* is a major problem in Michigan today. These plants are taking over our coastline and destroying the natural habitat. Luckily there are many ways of removing these destructive plants.

Herbicides are very effective but can be dangerous to the non invasive species in the area depending on the method you use. Methods such as swiping the plants individually and injecting the stems with the herbicide are effective and completely isolated but time consuming. Backpack spraying is practical and focused on specific plants but there can be slight runoff. Methods such as a boom sprayer and aerial application can treat large areas at once but may destroy some natural life there. There are two types of chemicals that are commercially used, glyphosate, and imazapyr. Glyphosate is the less expensive, safer chemical and treats the plant slower but is effective. It's used in consumer products like Round Up, and Rodeo. Imazapyr is a higher priced stronger and more effective chemical and is not commonly used by the average consumer. The two chemicals can be combined to treat the area even more effectively. Permits are required to use imazapyr and are suggested for glyphosate. Herbicides are highly effective and safe for most wildlife.[25]

Controlled burning is common after treating with herbicides. It is important that the area be treated with herbicides first or the burning will only encourage the growth of Phragmites. Burning is not a tool that can be used in itself; it is an aid to other treatments.

Mechanical removal is the process of cutting down said species. This is most often used after spraying herbicides much like the burning process. It may be used as a process alone but you would have to constantly keep up the cutting or the invasive species will return. Sadly, this will never truly get rid of a plant.

One of the newer and effective processes is the grazing process. A landowner may hire goats or sheep to consume the plants they wish to dispose of. With the goats eating habits the whole plant is eaten and the root is gone so it won't return. This process has been used elsewhere in the country but is not yet common in Michigan. Other animals that may be used to control invasive grasses such as cattle, horses, and geese goats however are the most tolerant which makes them the superior animals for the task.[26]

Invasive species are destroying our coastlines, why should we let this process continue when there are so many ways of removing these plants.

Purple Loosestrife Success Story
Cierra Dane

Purple loosestrife used to be a major problem for Hillsdale County, and throughout all of Michigan. These plants are not native, but that doesn't make them invasive. The bad thing about this plant species is that not only are they non-native, they damage, kill and push out native plant species. This in turn upsets the entire ecosystem. Native plants rely on enough soil to spread out and grow, as was intended when everything was created. To do this, they should not have to complete with non-native plants for adequate exposure to the sunlight, water, etc. When these native plants cannot grow, invasive species take over the remaining areas. Invasive species often become a problem because they overpopulate due to lack of predators, whereas the natural ecosystem should be perfectly balanced with the perfect ratio of predators to prey. This is the perfect cycle of nature and life. When humans, other animals, water, wind, etc. disperse the plants or their offspring, the areas that get "infected" with the invasive species infestation develop an unbalanced ecosystem. This is what purple loosestrife is doing when it creates monocultures in the native Michigan wetlands.[27]

The best proven way to control purple loosestrife is by introducing a bio-control beetle called, the *Galerucella*. This tiny bug has not been reported to feed on or harm *any* species other than purple loosestrife. Throughout the *galerucella's* life cycle, it will destroy or fatally damage all vital parts of the plant. The only other known ways to effectively control purple loosestrife are herbicides and pesticides.[28]

Current DNR and MNFI Guidelines and Funding for Controlling Invasive Plants
Nate Garrett

The Michigan Department of Natural Resources (MDNR) has contracted the Michigan Natural Features Inventory (MNFI) to "assess the status of invasive plants in Michigan and develop a strategy to address their negative impacts to wildlife." The two groups have come to a consensus that the most cost effective way to control invasive plants is to identify the species that pose the greatest threat to wildlife and to focus on prevention, detection, response, and control of the most volatile areas. For this plan to be effective it requires the understanding of the most important areas that are responsible for supporting wildlife, the threat, abundance, and extent of the invaders, and how cost effective the techniques are. The (MNFI) and (MDNR) have come up with a system of six strategic goals and objectives for addressing the issues that invasive plants pose.

Goal 1: Leadership and Coordination
The purpose of Goal 1 is to facilitate and implement science-based actions to eradicate or slow down the establishment and spread of invasive species in Michigan.

Goal 2: Assessment and Research
The purpose of Goal 2 is to assess the threat, status, and distribution of invasive plants that negatively impact wildlife.

Goal 3: Prevention
The purpose of Goal 3 is to prevent the introduction and establishment of high-threat invasive plants at state, regional, and local levels.

Goal 4: Early Detection and Rapid Response
The purpose of Goal 4 is to enhance the capacity to detect, report, and respond to newly detected introductions.

Goal 5: Control, Management, and Restoration
The purpose of Goal 5 is to reduce the spread and harm caused by established invasive plants.

Goal 6: Education and Outreach
The purpose of Goal 6 is to provide educational opportunities and products to professional and public audiences.

These goals have been created so that they may be implemented as a way for state, regional, and local governments to successfully combat the issue of invasive plants. The (MNFI) and (MDNR) had four driving principles that they kept in mind when coming up with these goals. They wanted to use the best available science, prioritize, collaborate, and monitor to ensure that all resources were being used effectively and efficiently to create the most successful system possible.[29]

One of the challenges that face a program like this is funding. Thankfully there are a number of collaborations and organizations and that have grants especially for invasive plant management. One way that funds could be secured is through the United States Department of Agriculture Forest Service. The U.S. Forest Service has steadily increased its funding to invasive plant management over the past couple of years and I believe it could be one option to turn to for funding.[30] Another option is to go to organizations for grants. Sustain our Great Lakes is a collaborative partnership amongst ArcelorMittal, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the U.S.D.A. Forest Service, the National Fish and Wildlife Foundation, the National Oceanic and Atmospheric Administration, and the Natural Resources Conservation Service. They award numerous grants in the Great Lakes Region that are specifically for on-the-ground restoration.[31] Another organization to go to is the Center for Invasive Plant Management. They have a database of many different grants that are available from the federal and state government, as well as, from organizations across the country.[32]There are many different sources for funding and grants, and I believe that this program can be successful with the financial help of grants of this nature.

Industry in Michigan
Melissa Mikolowski

Nursery and landscaping companies are significant stimulators of Michigan's economy. They contribute a great deal every year as one of the most important industries in the Great Lake State along with tourism and the automotive industry. They provide a large percentage of jobs to decrease unemployment rates. The companies grow and provide plants of many sorts to landowners all over the United States. Exotic species are turning into invasive species when they are not planted correctly and become a significant problem to the natural ecosystems of Michigan. Landowners need to be educated about the dangers of misplacing plants and the current exotic plants being sold need to be reviewed for the potential danger of them becoming a harmful invasive.

The nursery and landscaping industry covers a variety of different businesses. Any nursery, perennial plant production, Christmas tree, sod producers, landscaping and lawn care company is a part of the industry. These companies range from small to large and they grow, retail, install and plants and landscapes[33]. One organization, the Michigan Nursery and Landscape Association, founded in 1922, represents all the companies above along with the green industry, including the garden center, greenhouse production, grower, golf course design and maintenance, interior scrape, irrigation, landscape contractor, landscape design, landscape management, nursery production, supplier, turf management, and arborist. Through all these companies, the industry provides jobs for over 600,000 workers each year[34]. This gives many citizens of Michigan jobs and decreases the number of unemployed.

The nursery and landscaping industry is very profitable in Michigan. It contributes $1.2 billion to Michigan's economy. It is the second largest agricultural commodity in Michigan. The industry in Michigan is also the fifth largest nursery industry in the nation. Nursery and perennial plant producers generate about $291 million in annual sales. Contractors and designers generate $655 million each year, and lawn service companies and sod growers have contribute $272 million to Michigan's economy[35]. All these companies allow Michigan to function and are an important part of Michigan.

Nursery companies purchase plants from all over the world and grow them at the nursery's location. Generally, the plants taken are not harmful to the introduced ecosystem, but sometimes unpredicted results can occur. However, there is a group of nurseries called the Michigan Native Plant Producers Association, made up of twelve independent growers that sell over 400 species of Michigan native plants. Their mission is to "benefit member businesses by creating an ethical, profitable, and ecologically sound business environment" through "enhancing the diversity and health of Michigan's unique natural heritage."[36] Landscaping companies buy plants from different nurseries and plant them in various areas for decoration. Foreign plants are often used for ornamental purposes because of their exotic and varying appearances.

The nursery and landscaping industry is a beneficial industry to the state of Michigan. With proper education, landowners and planters can keep the industry in good name and keep native species safe from harmful invasive species. Nursery and landscaping companies should label their products and provide online information about plants about whether or not plants are able to be grown in certain areas. This will keep the industry as successful as ever and will allow Michigan's economy to thrive.

An Invasive Industry
Natalie Wright

"To foster the well-being and integrity of Michigan's green industry," is the proclaimed mission of the Michigan Nursery and Landscape Association (MNLA).[37] This statement makes the MNLA seem like an organization that would value the well-being of our environment, but in reality, the industry, not the health of the ecosystem is top concern. The invasive plant problems that Michigan is currently facing will not be resolved without the changes of the plant and greenhouse industry in Michigan. The industry has introduced multiple invasive species to our ecosystem, and the lack of guidelines and awareness that Michigan's 'green industry' has over them needs to be addressed.

The MNLA proudly boasts that it is the fifth largest nursery industry in the nation. This is impressive, yet so is the industry's lack of concern for their impact on the invasive species epidemic that Michigan is facing. Michigan, as a state, lists noxious weeds that are either or restricted from sale, but this is not a conclusive list of invasive species that are detrimental to the environment.[38] If a plant is not on the list but is still a knowingly harmful species, it's fair game for the MNLA to sell. The ornamental shrub *Frangula alnus* (glossy buckthorn)[39] and the flowering *Gypsophila paniculata* (baby's breath)[40] are all fair game for landowners in Michigan to purchase and plant. By selling these species to anyone who can afford to buy them, the MNLA is counteracting any efforts made by the DNR, DEQ, or USDA to try to control the spread of these plants. It also should be pointed out that the MNLA is not unaware of the fact that these species are incredibly harmful; Amy Frankman, executive director of the MNLA, is also head chair of the Michigan Invasive Plant Council (MIPC).[41] This 1.2 billion dollar industry[42] has a huge impact on how invasive species are affecting Michigan, which unfortunately is a negative one concerning the issue of invasive terrestrial plant species.

Each non-native invasive plant has its own specific harmful effects, and two especially harmful plants affecting Michigan are flowering rush[43] and baby's breath[44]. While baby's breath was accidentally introduced to the United States and flowering rush intentionally introduced as an ornamental, both continued to be sold in nurseries throughout Michigan.[45] These plants deep root systems crowd out the native plants that are essential to the health of the ecosystem, decrease the natural sand movement (decreasing nutrient recycling activity that normally occurs in the dunes), and significantly alter the biodiversity of the ecosystem there. The ecosystem of the Great Lakes sand dunes is considered to be one of the most severely threatened by invasives, not just because they are considered to be the most extensive freshwater dunes in the world, but because they contain more native species than any other Great Lakes ecosystem.

A combination of stricter sale regulations and more public awareness regarding the consequences of invasive species in the environment are two possible proposals that would help reduce the spread of these non-native plants without significantly harming the industry. Now, stricter sale regulations does not insinuate banning every species that is invasive, but it would involve analysis of how invasive a plant is, what environments it is known to thrive in, and the degree of damage the plant can cause to certain ecosystems. It's also important to note that this analysis would need to be a universally agreed upon one, much like the definition of an invasive species is in Executive Order 11312[46]. For example, baby's breath is an invasive species, but is really only harmful when grown near sandy soils. Stricter laws regarding sale of these types of

plants may involve investigating location of sale, quantity, or reason for planting. Increasing public awareness regarding the effects and types of invasive species is another compromise that would deter the spread of invasive species. If people are unaware of the fact that their favorite purple flower is detrimentally hurting the wetland habitat in their backyard, then they are not likely to stop planting that flower or others that may not be suitable for that environment. One clear way to do this would be to require nurseries and greenhouses to place labels or "warnings" on plants (or in their description in catalogues) that warn consumers of the effects the plant can cause to certain ecosystems. This could be analogous to the Surgeon General's warning that cigarette companies are required to place on their products. The National Park Service and the State of Michigan could also have a large impact; including information in kiosks, ranger's stations, billboards, or anywhere else that people using Michigan's beautiful land will see would surely cause people to stop and think about what they themselves have been planting. Michigan took initiatives to stop the Emerald Ash Borer from spreading (there's even an Emerald Ash Borer Awareness Week!); terrestrial plants can cause damage to the same extent.[47]

To improve the invasive species issue that Michigan is facing, major changes need to be implemented both within and outside of Michigan's Nursery Association. Stronger regulations and an increased amount of public awareness of this problem would both significantly aid in efforts to reduce the effects of harmful invasive species on our environment.

Point of Sale Invasive Terrestrial Plant Warning
Dakota Hewlett

In order to inform the public about species of terrestrial plants sold in the horticulture industry that may become an invasive problem if planted inappropriately it may be necessary to implement a warning label attached to the plant or place emphasis on the circulation of informational pamphlets at the time of sale. There are many products on the market that display certain warnings or suggestions for the consumer to get the best result out of the product they are buying. This sort of label would be beneficial to help ensure that plants that are invasive in certain circumstances are planted correctly to avoid undesired spreading and reproduction of the plant. These warning/advisory labels will be referred to hereafter as "informative statements" so as to not discourage the sale of said plants.

These statements would be displayed for the sole purpose of informing the consumer of the undesired growth that a particular plant may cause. These plants are what the public likes to use in landscaping for their aesthetic value and therefore are what the horticulture industry sells. These plants requiring the informative statements are plants that are only invasive in certain situations and conditions and are not invasive plants that have been banned by the government. These partially invasive plants may spread rapidly to locations not intended by the landscaper quickly overtaking other valuable ground and other plants and can be hard to eradicate. But this same plant when planted correctly can be a beautiful asset to any landscape. For example, common periwinkle, *Vinca minor*, is a good groundcover and used by many landscapers. When *Vinca minor* is planted in an open uncontained area such as on the side of a hill or below a stand of trees it will rapidly spread to other undesired areas choking out other plants, growing and

spreading greater than one foot per year. *Vinca minor* has an elaborate root system and will only spread over ground. The plant cannot spread across a barrier such as a sidewalk or other contained location. So when planted in areas such as landscape islands or beds surrounded on all sides by a sidewalk, solid pathway, courtyard, etc. it will not spread beyond the desired limits and can be a pleasant piece of landscape.[48]

By planting with a "right plant, right place" mindset a landowner can avoid the spread of invasive plants that may damage the natural species and create a monoculture. These informative statements could be printed and affixed onto the pot or container of the plant or otherwise attached to the product when sold. A statement may read, "This plant may spread beyond the intended area, please plant with care in these conditions…"

Public Education on Invasive Species
Riley Burch

Educating the public on invasive species is a large hurdle in the process of eliminating invasive species. If the public is not educated in which plants are helpful and which are hurtful, they will continue to plant and nurture invasive species, unaware of their negative effects on the environment.

When a concerned landowner visit's the DNR and DEQ websites searching for invasive species in Michigan, they will find very detailed pages on Phragmites. These pages instruct them on how to identify, control, and eradicate Phragmites. The DNR and DEQ have pages for a limited number of terrestrial invasive plants. This would leave the landowner with a false sense of security that their property is not home to any plants which may be harming their surroundings.

One program that really did a good job of showing coastal landowners the effects of both chemical and mowing processes on Phragmites was the Saginaw Bay Coastal Initiative Phragmites Control and Restoration Demonstration Project. This project was started in 2007, and used six 30-acre plots to demonstrate the six different methods which could be used to control or eradicate Phragmites on coastal land. In 2010, this project ended due to a loss of funding. Since then, the Phragmites has started to grow back into the once cleared areas.[49]

My recommendation would be for the DNR and DEQ websites to be updated with current information about what invasive species they currently find to be a problem on state land and what they are doing to get rid of them. I would also recommend either for more funding to be allowed for demonstration projects, or for other areas to be encouraged to start demonstration projects in an attempt to educate the public.

Public Education of Invasive Species
Madelyn McMillan

Recently I have gathered information from a survey about public education. It seems that there are only two problems with public education. According to the data on the survey most people did not know what invasive species can do to the environment, and the economy. They also didn't know how to take care of invasive species. Once again we need a way to educate these people so they better understand invasive species.

One efficient way to spread information is through the internet. Right now there are organizations with websites about invasive species. There are very good for looking up information but perhaps if we made them more pronounced we would have better educated citizens. There are a lot of people that are part of clubs, councils, or local conservation districts. If we put little exciting pieces of information on the home page of these websites they might be interested to learn more. There are some things like contests and sessions on how to remove invasive plants, but you have to search for them. Most people do not have time to scour dozens of websites for answers. There are many websites that are just for invasive species like the Center for Exotic Species (http://ces.mtu.edu/). However, we might need a little extra help.

We need to get education out into other places too. Newspapers and publicly sold pamphlets would be good places to look into. Unfortunately, even an ad in the newspapers costs money. There are also people, however, that we could assign to teach people about invasives. Public places such as stores or libraries would have a huge effect. People are there almost all the time, repeated lectures would most likely add to efforts toward public education.

Existing Federal Regulation
Margaret Spens

Each year Michigan loses its native species, because of the increase in invasive species. Many people know the common invasive species such as the zebra mussels, Asian carp, and purple loosestrife. However, there are many other invasive species that are dangerous to the environments for example, Bell's honeysuckle, multi-flora rose, and baby's breath. If people do not spread anymore of these invasive species, Michigan could save some of the favorable native species like the dwarf lake iris.

There have been many laws passed to enable these native species to have their life expectancy. One of the laws passed is §6006 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act. The department that is organizing this act is the U.S. Department of Transportation, Federal Highway Administration. The organisms that are involved in this law are terrestrial and aquatic noxious weeds. According to the U.S. Department of Transportation (2005) includes a provision that makes activities for the control of noxious weeds and the establishment of native species eligible for Federal-aid funds under the National Highway System (NHS) and the Surface Transportation System (STP). The control of terrestrial noxious

weeds and aquatic weeds is commonly done by maintenance districts or contracted crews of each State department of transportation. Historically, maintenance activities have been the responsibility of the State and therefore have not been eligible for Federal-aid dollars.[50]

The grouping refers to the organization of the native and non-native species, but not "known invasive species" or noxious weeds for one or more of these occupations: abatement of storm water runoff, stabilization of soil, and aesthetic enhancement. The management of the noxious weeds for this law includes weed prevention, rapid response to new weed infestations, control, reinstallation, and monitoring by the state or the transportation establishment. If these plants are dangerous to the surrounding environment, then the state or transportation establishment will apply using the actives of cultural, mechanical, bio-control, or chemical methods. The training involved is from the state's internal forces, contacted crew, and construction contractors that employ the controlling of the noxious weeds.[51]

Another act that is the focal point on invasive species is Noxious Weed Control and Eradication Act. The department that is organizing this act is the U.S. Department of Agriculture. The organisms that are involved in this law are noxious weeds. According to the U.S. Department of Agriculture (2004) (a) In General.--The Secretary (of the department of Agriculture) shall establish a program to provide financial and technical assistance to control or eradicate noxious weeds.[52]

This commandment states that they will educate and increase the public knowledge or the common people. In addition, the federal, state, and local representatives with the acceptation of Indian Tribe, private organizations, individuals, and State-recognized conservation districts or State recognized weed management districts. The actives of the noxious weeds that are involved in this law what is the main problem, the likely-hood of if this noxious weed will grow, how big the problem is, how the United States will deal with this problem, how the United States plans to coordinate this action, and any other actions that could compile with this action.[53]

Another act the impacts the terrestrial invasive species is the Plant Protection Act. The department that is implicated with the Plant Protection Act is U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS). The organisms that occupied are plant, plant material, and plant pests. According to the Plant Protection Act (2000) Consolidates and modernizes all major statutes pertaining to plant protection and quarantine (Federal Noxious Weed Act, Plant Quarantine Act) Permit APHIS to address all types of weed issues, increase maximum civil penalty for violation, authorize APHIS to take both emergency and extraordinary emergency actions to address incursions of noxious weeds. The prohibition or the movement of the plants concerned with this law no one can import, enter, export, or move in interstate commerce except if they are authorized under a general or specific permit. With the accordance regulations as the Secretary may issue to prevent the introduction of noxious plants into or within the United States. The requirements used for the processes are regulations under subsection. In addition, governing consideration or import requests are based on sound sciences that are transparent and accessible.[54]

The petition to add or remove plant pests from regulation states that any person may petition the Secretary to add a plant pest to, or remove a plant pest from, the regulations issued by the Secretary. If a person wanted to add or remove a plant pest then they would have to have a

certificate of inspection issued by appropriate officials of the country or state for where the noxious plant is moved. The Secretary (of the department of Agriculture) has to determine whether the plant pest may be infested with other plant pests, may pose a significant risk of causing injury to, damage to, or disease in any plant or plant product or may be a noxious weed and be subject to remedial measures the Secretary determines to be necessary to prevent the spread of plant pests.[55]

Therefore, many populations of our native species are declining in numbers. Much of the public are aware of the common invasive species, but they do not know the invasive species that are damaging our ecosystems. What I would recommend for the State of Michigan to decline the number of invasive species would to make sure the state's internal forces, contracted crews, and construction contractors need to increase their control activities for the invasive species that they are destroying. In addition, update the public's education on the process of the controlling of the invasive species.

Existing State Bills
Jerry Dunham

There are very many non-native species coming into Michigan. Not all non-native species are invasive species. There are some native species in Michigan that are invasive species. There are many laws in Michigan to prevent the spread of invasive species in Michigan. There are many bills that are passed on invasive species.

In Senate Bill No.18, which is still in committee, says do not any do of the following in "this state at any specific location where the organism is not already naturalized stock, place, or plant the organism, release or allow the release of the organism, or use the organism as live fish bait."

"Any of the following prohibited aquatic plant species, including a hybrid or genetically engineered variant of the species or a fragment, including a seed or other propagate, of the species or of a hybrid or genetically engineered variant. In this part it has Japanese knotweed, *Fallopia japonica*, is listed as an aquatic invasive species."[56]

"In this bill it says purple loosestrife *Lythrum salicaria*, except that cultivars of purple loosestrife developed and recognized to be sterile and approved by the director of the department of agriculture under section 16a of the insect pest and plant disease act, 1931 PA 189, MCL 286.216a, are not a restricted species." The bill goes to tell about the imposed fines.

In House Bill No. 4826, which is still in committee, says that "the council shall submit a report with recommendations for legislation or rules to prevent the introduction and spread of AIS (aquatic invasive species) through trade, including the aquarium, bait, pet, water garden, horticulture, aquaculture, and shipping trades. The council shall submit the report to the governor, the senate majority leader, the speaker of the House of Representatives, and the

standing committees of the Senate and House with primary responsibility for natural resources, conservation, agriculture, and commerce."

It also says what the report must recommend on. "The risk assessment processes to screen aquatic species proposed for trade and to screen pathways of introduction and spread, harmonizing federal and state law on aquatic species establishing a program for aquatic species in trade, connecting regulations and education on aquatic species in trade, financial and other resources for implementing recommendations and proposals for collaborating with other Great Lake States and Canadian Provinces."[57]

Proposed Laws for Terrestrial Invasive Species
Mallory Ramelis

Michigan has abundant natural resources that are very useful for tourism, and the economy. What came with these beautiful natural resources are the bad ones, invasive species. There are many types of invasive species, ranging from aquatics to terrestrial. In this report I will be going over the current and past laws that the state has set to try and regulate them.

Some of worst invasive terrestrial species in Michigan are; garlic mustard, common buckthorn, Eurasian bush honeysuckles, and the autumn olive.

While the garlic mustard is an invasive woodland species, and is mainly found in the Lower Peninsula. Through Michigan State University, they are conducting a project called garlic mustard Project. During their study, they will be observing the impact that these plants have and they will be conducting an evaluation on the elevation of population and the distribution in Michigan. They have found out that the mustard can grow in multiply types of forests. [58]

The common buckthorn is being studied with a collaboration of Michigan State University, Ohio State, Iowa State in a three year research project that is supported by a $494,000 Agricultural and Food Research Initiative grant funded by the U.S. Department of Agriculture. Not only is this plant an invasive, it's also the host for the soybean aphid. The soybean aphid damages soybean plants and is capable of spreading viruses to vegetable crops. [59]

There are four different types of Eurasian bush honeysuckles. Each of the species has similar characteristics. All four of the species are found in the Upper Great Lakes region, and in many types of habitats. The four species all produce seeds which are spread mainly by birds, or small mammals. The methods used to rid of these plants are, chemicals, management, or by combined methods. The species itself is causing an over abundance of damage to the natural habitats that host native species.[60]

The autumn olive is dangerous because it has berries that birds are attracted to. The autumn olive has a natural toxin in it eventually killing birds and any mammals that try to feed

on it. Like any invasive it ruins the chemistry of the soil, killing the plants around it. The Michigan Department of Natural Resources has used many types of chemical treatments to control the spreading of it.

The only prohibition that the state of Michigan has on the invasive terrestrial plant species is a list of restricted weeds. This list only regulates the sale, advertisement, or transport of certain noxious weed seeds that are only considered bothersome or economically detrimental. There are two lists, the Prohibited, which says that no weed seed can be sold or transported into the state, and the Restricted which some weed seeds are only permitted when there is a strict number being brought into Michigan. The Prohibited Noxious Weed list only consists of 19 species. The Restricted Noxious Weeds list consists of 23 species. None of the worst invasive terrestrial species in Michigan is listed on either of the list. These lists were created under Regulation 715. The Michigan Seed Law (Act 329 of 1965) includes the limit on percentage of weed seed[61]. The Michigan Seed Law was put in place to help regulate the labeling, coloration, advertising, sale, offering, exposing, or transporting of noxious weed seed. This Act also includes the violations to a person who is caught. Under section 286.715 of the Act, it states " A person who violates this act is guilty of a misdemeanor punishable by a fine of not less than $100.00 nor more than $2,000.00 for each offense, or, by imprisonment not more than 90 days". This is the only Act that enables a punishment for someone.[62]

This report covered the proposed laws that Michigan has set in order to try and control the intake of invasive terrestrial species into the state. It also included the punishment of someone who incorrectly labels an invasive plant and sells it or someone who has bought a much too large percentage of noxious weed seeds. The worst invasive terrestrial plants in Michigan, that is not on either of the lists. My recommendation is that the State of Michigan add more plants to the prohibited and Noxious Weed Act and add more regulations to the Invasive Species Act.

The Michigan Invasive Plants Council Invasive Species Assessment Tool

Duncan MacLeod

One possible model for an improved invasive species assessment program for Michigan is the invasive plant species assessment tool created and updated by the Michigan Invasive Plants Council. The Michigan Invasive Plant Council was created as a direct result of the Federal Executive Order on Invasive Plants, signed by President Clinton in 1999[63]. The group met to formally address mutual concerns about the effects of invasive plants in Michigan. The committee in charge of the model assessment tool is made up of representatives from government agencies and related industries, and is chaired by a Michigan State University associate professor of horticulture. The stated purpose of the council as laid out by President Clinton's Executive Order is: "To protect Michigan from the threat of invasive plants" according to their mission statement[64].

Outline of the assessment tool
Sections:

- Section I: Biological Character; ability to spread
- Section II: Impact; ecological, aesthetic, economic influence on natural areas
- Section III: Distribution; identifies the extent to which the plant is reported to be a problem
- Section IV: Control Methods; availability of mechanical, chemical, biological, and fire as a resource in managing or eradicating the plant in question
- Section V: Management Effort; management potential (investment in human and financial resources) and management activity (programs being presently conducted)
- Section VI: Value within the state; aesthetic, erosion control, and wildlife habitat value
- Section VII: Plan of action

The MIPC assessment tool provides a scientific process for identifying invasive species as well as weighing the risks and costs of controlling them. The assessment is divided into seven parts. The first six are all steps to scientifically assess risks, cost of control, value, extent of current distribution, and other important information to come up with a rating based on the aforesaid information[65].

Once the results from the first sections have been obtained, Section seven details how to rank an invasive on Potential for Invasiveness, Invasiveness (a function of both the invasive potential as well as impacts), and Regional Importance in different ecosystems and regions of the state. These ranks are used by the MIPC Plant assessment committee for endorsement and the development of a plan of action which may include: Education, Suppression, Restoration, and Elimination, depending on the level of threat.

A state assessment program based on this model would allow the State of Michigan to identify invasive species more scientifically. This would streamline the process of identification and reduce or eliminate effort wasted on plant species that do not need it, as well as finding the most efficient and cost effective methods for those that do require controls, while targeting those that do pose a significant threat before they become too costly to deal with.

The Michigan Invasive Plants Council Invasive Species Assessment Tool
Nicolas Heilman

The Michigan Plant Invasiveness Assessment System has been divided into seven sections each created to break the suspected species into the main components that define an invasive species. This refined info can be used to decide whether or not a species is in fact, a risk to Michigan. For example, the *Alliaria petiolata*, or garlic mustard, has been put through this assessment.

Section I – Biological Character, Reproductive Ability and Dispersal

Reproductive ability identifies a plant's invasive tendency in Michigan. Dispersal identifies the vectors or agents of dispersal and the likelihood of long distance dispersal. Dispersal agents are Environmental Influences such as: wind and water; wildlife, both mammals and birds; domestic animals, both mammals and birds; and human activity. garlic mustard has a high seed production and dispersal.

Section II – Impact

The impact section identifies the plant's ecological, aesthetic, economic influence on natural areas, constructed habitats, managed landscapes, and production systems. The garlic mustard aggressively monopolizes light, moisture, nutrients, soil and space preventing the native plants from growing.

Section III – Distribution

The distribution section identifies known occurrences of this plant. It indicates the area of origin for the plant and the earliest documented occurrence in North America. Then, for Michigan, identifies the extent to which the plant is reported to be a problem in each of four ecological regions. Garlic mustard occurs in most to all moist, shaded soil of river floodplains, forests, roadsides, edges of woods and trails edges within Michigan.

Section IV – Control Methods

Control Methods document the availability of mechanical, chemical, biological, and fire as a resource in managing or eradicating the plant in question. In garlic mustard's case in small infestations, hand clipping and pulling rosettes or flowering plants prior to seed set is recommended. For long established dense populations, it is recommended to apply herbicide in the spring or in the dormant season if non-targets are present. Also, using a mid-intensity burn late in spring, followed by herbicide applications, cutting, or pulling of surviving plants may greatly increase the eradication success rate.

Section V – Control Effort

Control Effort identifies the control methods' potential (investment in human and financial resources) and management activity (programs being presently conducted). Control potential considers feasibility, costs, and unavoidable non-target damage. Management activity identifies current programs being employed to eradicate or suppress this plant in the public and private arenas.

Section VI – Value within the State of Michigan

An invasive species value within Michigan indicates value associated with agriculture, horticulture, turf, forestry, landscape development, soil and water conservation and wildlife habitat. Garlic mustard is used in salads and recipes by a few creative amateur chefs. Not offered commercially. Not reported to have any other value.[66]

Notre Dame Research and the Nature Conservancy
Kennedy Cogswell

The Nature Conservancy and Notre Dame and partners are coordinating a three point strategy to combat the threat of invasive species. Notre Dame Environmental Change Initiative (ND-ECI) is tackling the interrelated problems of invasive species. The goal of ND-ECI is to provide solutions that minimize the trade-offs between human welfare and environmental health where trade-offs are unavoidable, and to discover win-win solutions where they are possible. Ways they are trying to figure this out is by prevention, early detection and rapid response, and management of established species. New DNA technology is being used to detect Asian carp and decide how many fish and how bad the invasion is in the Chicago canal. Plant screening tools are being developed to identify potential harmful plants in water gardens and aquarium trades, so that the state or government can prevent potential commercial sales. They are also refining survey methods and undertaking large scale survey to identify new populations of harmful aquatic plants. The last thing they are doing is looking at recreational boaters pathways and trying to understand factors that might influence where and how far plants might be being spread from recreational boats.

The Asian carp invasion front was located through a novel cutting-edge technique called "environmental DNA" or "eDNA." From the summer of 2009 through May of 2010, scientists from Notre Dame and The Nature Conservancy collected and analyzed more than 1,000 two-liter water samples from the Chicago Sanitary & Ship Canal, as well as other water bodies in the Chicago metropolitan area. Then, using a combination of high-tech genetic tools, they sifted those samples to find traces of eDNA from all sorts of species, including Asian carp. The research showed that eDNA is superior to traditional methods for locating and monitoring aquatic species invasions. While so far the eDNA technology has only been used on alien species like Asian carp, Notre Dame's scientists believe that the eDNA methodology has strong promise in endangered species detection and monitoring as well. The scientists' work has now been expanded to a search for Asian carp eDNA throughout large swaths of the Great Lakes watershed.

Rapid species detection in the field is only one aspect of cutting-edge genomics research through the Notre Dame's Environmental Change Initiative (ND-ECI). Recent technological advances in genetic detection and improvements in DNA sequencing have rapidly increased the application and power of genetic analysis while reducing costs. Applying these "genomic detection" technologies to environmental issues will enhance our ability to create solutions that serve nature and humans. Key goals of this research are to develop cost-effective methods for

detecting species (including harmful invasives), assess overall species diversity in aquatic and terrestrial communities, and examine genetic diversity within species that are sensitive to environmental change. These technologies promise to revolutionize natural resource management by providing officials with much better data on populations and communities than they have ever had before.

Using the greater Chicago area as a "test bed" for national and international research and outreach, Notre Dame Scientists plan to create an online research community or "collaboratory" that engages researchers, students and policymakers in a nationwide science-based conversation about climate change adaptation. As part of this effort, Notre Dame and collaborators at The Nature Conservancy are developing state-of-the-art climate forecasting tools as well as surveying expert opinion about climate change adaptation. The collaboratory project is funded, in part, by a Cyber-Enabled Discovery and Innovation grant from the National Science Foundation. One adaptation strategy that will be examined is "managed relocation," a controversial strategy to physically move certain species from their native environments to new areas in order to help them better adapt to changes in climate.

NWF Assessment Model
Susan Smith

There are many species in Michigan today that confuse the public. The There needs to be a way for multiple government agencies as well as the public to distinguish what plants are actually invasive species. The National Wildlife Federation recognized this problem and is beginning to come up with a solution. It is called the Invasive Species Assessment Protocol.[67] It describes a new process for discovering, categorizing and listing invasive species.

There have been many different organizations that have attempted to compile a list of 'invasive species' in different areas across America and the lists are all different. The goal of the Invasive Species Assessment Protocol is to compile a list of both non-native and invasive species that is common throughout the United States.[68] To be on this list, the plants in question are to go through a series of tests and questions to determine whether or not the plant is in fact an invasive or not.[69] It has already been used on 500 different plants.

The program is designed for large areas and ecoregions. It is also meant only for use on one species at a time due to the depth of the information being gathered. It includes two preliminary questions followed by 20 body questions that create the majority of the protocol. The score the plant receives is called an I-Rank (Invasive Species Impact Rank). The I-Rank of a particular plant is determined by the following questions:[70]

Section I. Ecological Impact (five questions, 50% of I-Rank score)

- Impact on ecosystem processes and system wide parameters (33 points maximum)
- Impact on ecological community structure (18 points maximum)
- Impact on ecological community composition (18 points maximum)
- Impact on individual native plant or animal species (9 points maximum)

- Conservation significance of communities and native species threatened (24 points maximum

Section II. Current distribution and abundance (four questions, 25% of I-Rank score)

- Current range size in region (15 points maximum)
- Proportion of current range where it negatively impacts biodiversity (15 points maximum)
- Proportion of regions biogeographic units invaded (3 points maximum)
- Diversity of habitats or ecological systems invaded in region (3 points maximum)

Section III. Trends in distribution and abundance (seven questions 15% of I-Rank score)

- Current trends in total range within the region (18 points maximum)
- Proportion of potential range currently occupied (3 points maximum)
- Long-distance dispersal potential within region (9 points maximum)
- Local range for expansion or change in abundance (18 points maximum)
- Inherent ability to invade conservation areas and other national spp. habitats (6 points)
- Similar habitats invaded elsewhere (9 points maximum)
- Reproductive characteristics (9 points maximum)

Section IV. Management difficulty (four questions, 10% of I-Rank score)

- General management difficulty (18 points maximum)
- Minimum time commitment (15 points maximum)
- Impacts of management on native species (15 points maximum)
- Accessibility of invaded areas (3 points maximum)

After the plant in question is put through the protocol, it is given a rank that determines whether or not it is dangerous to the ecosystem or not. The ranks are from High to Insignificant.[71] There are many plants that are put through the protocol that are not invasive, and those plants are sorted out by the first 2 questions.

This protocol is not as lengthy as some of the other assessment plans out there, but the information the protocol uses and the results it defines are extremely useful. I recommend that the state of Michigan adopt the National Wildlife Federation's Invasive Species Assessment Protocol as the universally accepted method for detecting and categorizing invasive species.

Risk Benefit Analysis
Kenny Smith

The Notre Dame Assessment program is a way of determining whether a species is invasive. This program will outline the risks and benefits of a set assessment program

An assessment could be risky in several ways. First off, it is just a program. Things can fall through the cracks even if it's not easy. This could be potentially problematic, given what's at stake. Secondly, it would have to be updated constantly. The papers do not advance as fast as nature is capable. Bills are only updated as quickly as their funded –Shawn Lloyd. And lastly it could raise an issue with the different parties of support. Even with the assessment program some people will still lobby for or against the issue. And in politics you can't make anybody mad.

The assessment program could also be beneficial. If every new imported species if put through Said assessment program we as a citizen body can take action against it. It can save millions of government dollars by eradicating the species. Like most problem the longer you let it go the harder it is to take care of. It could potentially create jobs also. When there are things to be done you have to pay someone to do it.

As previously stated the Assessment program could be both beneficial and detrimental in several ways. I encourage the legislature to take action either for or against this program.
I contacted several people to get opinions on the invasive species assessment program. The first question was: what are three basic criteria you would like to see in an assessment program. One of the most general consensuses was it must be easy to do. It has to be reliable and able to do what it has to do quickly. It would have to identify all the positives and the least false positives. It would have to be able to identify the biological trait of the plant in question. It would have to be able to be updated constantly.

My second question was what else an assessment program needed. It needs to assess the real harm of the plant. Often being discussed, harm has to be real. There are countless examples of plant where benefit outweighs any possible harm. Norway maple is an invasive species, but when planted in an urban setting with a concrete surrounding, it is a safer and alterative way to put the "right plant, right place" idea into effect. The program must focus on prevention. It has to follow an "early detection, rapid response" policy. It must be solid, but it must be able to be overridden. When something that without a doubt is invasive we need to be able to kill it.

The Michigan 4-H Youth Conservation Council would like to set forth the following recommendations:

- To make sure the State's internal forces, contracted crews, and construction contractors would keep monitoring the potentially invasive species that they are working to control
- To support public education on the process of the importance of controlling invasive plants
- For the horticultural industry to include informational statements for invasive plants at the point-of-sale
- To fund organizations that are making an effort to prevent, control invasive species and educate the public
- To adopt Executive Order 13112 as the proper definition for invasive species
- To adopt a state standardized assessment system for the identification of terrestrial non-native invasive species

We would like to promote the creation of a standardized assessment for the identification of invasive species. The Council hopes that you consider creating the assessment to help protect the endangered terrestrial species that are vital to their surrounding habitats. In conclusion to the testimony as presented to you today, we would like to thank you for your time and consideration.

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